others have recently called attention, and to which Mr. Riley has contributed by his history of *Epicauta* and other *Meloidæ*. I refer to the questions connected with so-called hypermetamorphosis in insects. In these cases there are changes of form during the larval period greater than exist between larva and pupa, or even between larva and imago, in some insects. There are also slighter changes than these which very many larvæ undergo; indeed it may safely be asserted that the newly-hatched and the mature larvæ of all external feeders differ from each other in some important features. The differences are really great (when compared to the differences between genera of the same family at a similar time of life) in all lepidopterous larvæ, as well as in all Orthoptera which have come under my notice. No attempt to co-ordinate these differences, or to study their meanings, or to show the nature of their evident relationship to hypermetamorphosis has ever been attempted.

Not less inviting is the boundless region of investigation into the habits of insects and their relation to their environment. The impulse given to these studies by the rise of Darwinism, and the sudden and curious importance they have assumed in later investigations into the origin and kinship of insects, need only to be mentioned to be acknowledged at once by all of you. The variation in coloration and form exhibited by the same insect at different seasons or in different stations, "sports," the phenomena of dimorphism, and that world of differences between the sexes, bearing no direct relation to sexuality; mimicry also, phosphorescence and its relations to life, the odours of insects, the relation of anthophilous insects to the colours and fructification of flowers, the modes of communication between members of communities, the range and action of the senses,[1] language, commensalism—these are simply a few topics selected quite at random from hundreds which might be suggested, in each of which new observations and comparative studies are urgently demanded.

The fundamental principles of the morphology of insects were laid down by Savigny in some memorable memoirs more than sixty years ago; the contributions of no single author since that time have added so much to our knowledge, notwithstanding the aid that embryology has been able to bring. Nevertheless there remain many unsolved problems in insect morphology which by their nature are little likely to receive help from this source. Let me mention three:—

The first concerns the structure of the organs of flight. The very nomenclature of the veins shows the disgraceful condition of our philosophy of these parts; the same terminology is not employed in any two of the larger sub-orders of insects; names without number have been proposed, rarely however by any author with a view to their applicability to any group outside that which formed his special study; and a tabular view which should illustrate them all would be a curious sight. A careful study of the main and subordinate veins, their relations to each other, to the different regions of the wing, to the supporting parts of the thorax and to the alar muscles, should be carried through the entire order of insects; by no means, either, neglecting their development in time, and possibly deriving some assistance in working out homologies by the study of their hypodermic development.

The second concerns the mouth parts. The general homologies of these organs were clearly and accurately enough stated by Savigny, though one may perhaps have a right to consider the last word not yet said when one recalls Saussure's recent claim to have found in *Hemimerus* a second labium. What I refer to, however, is another point: it relates to the appendages of the maxillæ and the labium. Considering the labium as a soldered pair of secondary maxillæ, we have at the most, on either pair of maxillæ, three appendages upon either side. These appendages, as you know, are very variously developed in different sub-orders of insects, or even in the same sub-order; and it has at least not been shown, and I question if it can be done, that the parts bearing similar names in different sub-orders are always homologous organs. Here is a study as broad and perhaps as difficult as the last.

The third is the morphological significance of monstrosities, especially of such as are termed monstrosities by excess. The literature of the subject is very scattered, and the material much more extensive than many of you may think. At present this subject is, so to speak, only one of the curiosities of entomology, but we may be confident that it will one day show important relations to the story of life.

[1] Notice Meyer's beautiful studies on the perception of sound by the mosquito.

After all the labours of Herold, Treviranus, Lyonet, Dufour, and dozens of other such industrious and illustrious workers, is there anything important remaining to be done in the gross anatomy of insects? some of you would perhaps ask. Let the recent work of some of our own number answer, which has shown in the Hemiptera and Lepidoptera the existence of a curious pumping arrangement by which nutritious fluids are forced into the stomach. It is certainly strange that after all that has been said as to the mode in which a butterfly feeds, no one should have dissected a specimen with sufficient care to have seen the pharyngeal sac which Mr. Burgess will soon show us. No! the field is still an open one, as the annual reviews clearly show. The curious results of Flögel's studies of the brain, the oddly-constructed sense-organs found by Graber and Meyer (earlier noticed briefly by Leydig) in the antennæ of Diptera, the important anatomical distinctions discovered by Forel in different groups of ants, the strange modification of the tip of the spiral tongue in *Ophideres*, which Darwin, Brietenbach, and Künckel have discussed, and, above all, the extensive investigations of the nervous system in insects generally which Brandt has recently undertaken, the exquisite memoir of Grenacher on the structure of the compound eye, and the keen researches of Graber in various departments of insect anatomy, show by what has been accomplished how many harvests are still unreaped. The microtome, too, has put a new instrument of precision into the hands of the investigator in the field.

If these few words shall arouse in any one a higher ambition, leading to better work, their aim will have been accomplished.

SCIENTIFIC SERIALS

American Naturalist, August 1880.—D. P. Penhallow, the fabrication of Aino cloth.—H. D. Minot, English birds compared with American.—J. S. Gardner, on the age of the Laramie formation as indicated by its vegetable remains.—J. E. Todd, on the flowering of *Saxifraga sarmentosa*.—Prof. A. N. Prentiss, distribution of obnoxious insects by means of fungoid growths.—Recent literature.—General notes.—Scientific news.

September.—J. Walter Fewkes, the Siphonophores:—No. 1, the anatomy and development of Agalma.—Prof. A. N. Prentiss, destruction of obnoxious insects by means of fungoid growths (concluded); the result of these experiments would seem to indicate plainly that yeast cannot be regarded as a reliable remedy against such insects as commonly affect plants cultivated in greenhouses or in windows, but the general question is by no means as yet decided.—O. B. Johnson, birds of the Willamette Valley, Oregon (concluded).—C. O. Whitman, Do flying-fish fly?

Annalen der Physik und Chemie, No. 8.—On electric expansion (continued), by G. Quincke.—Clausius' law and the motion of the earth in space, by E. Budde.—On the dependence of the electric conductivity of carbon on the temperature, by W. Siemens.—On the phenomena in Geissler tubes under external action, by E. Reitlinger and A. v. Urbanitzky.—Complete theory of the bifilar-magnetometer and new methods of determining the absolute horizontal intensity of the earth's magnetism, as also the temperature and induction coefficients of magnets, by H. Wild.—On the comparison of the electrodynamic fundamental law with experience, by R. Clausius.—On a direct transformation of the vibrations of radiant heat into electricity, by W. Hankel.—On fluorescence, by E. Lommel.—On the behaviour of different heat rays in the reflection of polarised rays from metals, by H. Knoblauch.—Remark on the heat conductivity of mercury, by H. Herwig.—Remarks on H. Weber's memoir on heat-conduction in liquids, by A. Winkelmann.—On air-resistance, by G. Recknagel.—On the action of hollow, in comparison with that of solid, steel magnets, by W. Holtz.

No. 9.—On the compressibility of gases, by F. Roth.—On the electric conductivity of some salt solutions, by J. H. Long.—New experimental researches on fluorescence, by O. Lubarsch.—On constants of refraction, by L. Lorenz.—Experimental researches on refraction constants, by K. Prytz.—Theory of reflection and refraction at the limit of homogeneous, isotropic, transparent bodies, with generalisation and extension of the foundations of Neumann's method, by M. Réthy.—Thermal theory of development of electricity, by J. L. Hoorweg.—On the behaviour of electricity in gases, and especially in vacuum, by F. Narr.—Defence of the law of corresponding boiling temperatures, by U. Dühring.—Equation of the state of atmospheric

air, by G. Schmidt.—Time of discharge of the Ley den battery, by P. Riess.

Journal of the Royal Microscopical Society, vol. iii. No. 4 (August, 1880), contains: John Badcock, notes on Acinetina (*Trichophrya epistylidis* and *Podophrya quadripartita*) with a plate.—J. W. Stephenson, on the visibility of minute objects mounted in phosphorus, solutions of sulphur, bisulphide of carbon, and other media.—Dr. George Hoggan and Dr. F. Elizabeth Hoggan, on the development and retrogression of blood vessels, with a plate.—Dr. Jas. Edmunds, on a parabolised gas slide.—The record of current researches relating to invertebrata, cryptogamia, microscopy; bibliography, and proceedings of the society.

Journal de Physique, September.—On the alternating currents and the electromotive force of the electric arc, by M. Joubert.—On the formula of interpolation of M. Pictet, by M. Szily.—Absolute measurement of Peltier's phenomenon in contact of a metal, and its solution, by M. Bouty.

Bulletin de l'Académie Royale des Sciences (de Belgique), No. 8.—On the embryonal leaves and the notochord in Urodela, by M. van Bambeke.—Researches on the spectrum of magnesium in relation to the constitution of the sun, by M. Fiévez.—On the presence of phosphoric acid in the urine of cows, by M. Chevron.—Excretory apparatus of Trematodes and Cestoides (2nd paper), by M. Fairfont.—Researches on fusel oil (amylic alcohol, &c.) in commercial alcohol, brandies, &c., by M. Jorissen.—On the structure of the venomous apparatus of Araneides, by Mr. MacLeod.—On the gastric gland of the American ostrich, by M. Remouchamps.—On the geometric representation of co-variants of a biquadratic form, by M. Le Paige.

Morphologisches Jahrbuch (Gegenbaur's), Bd. vi., Heft 3.—J. E. V. Boas, on the heart and arch of the aorta in Ceratodus and Protopterus, with three plates and woodcuts (a memoir both descriptive and critical of the various researches on this subject by Hyrtl, Owen, Peters, Lankester, and Günther).—G. v. Koch, notes on corals, with a plate.—George Ruge, researches on the process of development of the sternum, and on the sterno-clavicular attachments in man, with three plates.—W. Salensky, contribution to the developmental history of the ear cartilages in mammals, with a plate.

Zeitschrift für wissenschaftliche Zoologie, Bd. xxxiv., Heft. 3, July.—Gustav Häuser, physiological and histological investigations on the organ of smell in insects, three plates (finds in most insects well-marked nerves springing from the cephalic ganglia distributed to the antennæ, where special hypodermic cells receive them; the development and structure of these are beautifully illustrated).—O. Zimmermann, on a peculiar formation in the abdominal vessels in an Ephemeris larva.—Prof. F. E. Schulze, researches on the structure and development of the sponges: No. 9, the Plakinidæ, three plates (three new genera and five new species described).—John Hönigschmied, brief notices concerning the distribution of the gustatory papillæ in mammals.—Dr. J. W. Spengel, contribution to a knowledge of the Gephyrea, four plates (*Echiurus Pallasii*).

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, September 27.—M. Wurtz in the chair.—The following papers were read:—On the non-recurrence of the anthracoid affection, by MM. Pasteur and Chamberland. Their experiments prove that in the case of *charbon*, as in that of chicken cholera, inoculations that do not prove fatal are preventive of a recurrence of the disease. M. Pasteur argues against M. Chauveau's theory that such non-recurrence is due to production of matters adverse to the proliferation of the bacterium. Experiments had been made with a view to testing a remedy for charbon devised by M. Louvrier, but were indecisive.—On the results obtained by M. Rondaire in his exploration of the Tunisian and Algerian chotts, by M. de Lesseps. M. Rondaire's conclusions are entirely favourable to filling the basin situated between the Gulf of Gabes and the projected line of railway from Biskra to Tuggurt. This would make an interior sea about 400 km. in length and 1,600 km. in circumference.—A vapour-tension manometer for analysing liquids and measuring pressures, by M. Perrier. A glass tube, tapering at the lower end, stands with this (open) end in mercury, contained in, but not filling, an oblong closed bulb, a few drops of a volatile liquid being imprisoned above the mercury. The liquid to be determined is heated in a small boiler and the bulb referred to is placed in the vapour. The liquid of the manometer (which should emit vapour of greater tension than the liquids examined) acts by its vapour on the mercury, forcing it up the tube to various heights.—On a property of Poisson's function, and on the integration of equations with partial derivatives of the first order, by M. Gilbert.—On the theory of sines of superior orders, by M. Farkas.—On the invention of binocular telescopes, by M. Govi. The invention is commonly attributed to the Capuchin monk Schyrleus de Rheita, who published an account of it in 1645. M. Govi finds, from the papers of Peirescq in the Bibliothèque Nationale, that a spectacle maker in Paris, D. Chorez, made and presented binocular glasses to the king in 1625, *i.e.* twenty years earlier.—On the difficulty of absorption and the local effects of the poison of *Bothrops jararaca*, by MM. Couty and Lacerda. Whichever the mode of introduction, cellular, muscular, or serous tissue, brain, heart, or lung, and whatever the quantity of poison injected (vascular ruptures and antecedent wounds apart), there is no distinct sign of penetration of the poison into the blood. There is always local inflammation, which for some organs may prove rapidly fatal. The lung is most sensitive in this respect, the stomach and intestine least.—Study of the vertebræ in the order of Ophidians, by M. Rochebrune.—On the ciliated embryo of the *Bilharzia*, by M. Chatin. The signification assigned by helminthologists to this embryo in the cycle of development of the species requires (in the author's opinion) to be profoundly modified (a superiority of constitution being observed).—Researches on the presence of micrococcus in the diseased ear; considerations on the *rôle* of microbes in auricular furuncle (boil) and general furunculosis; therapeutic applications, by M. Loewenberg. He has observed a microbe in furuncle of the ear. These small abscesses spread in the ear by what he calls *autocontagion*, and from individual to individual contagiously. In treatment he employs thymic or boric acid. In cases of neglected otorrhea or wetness of the ear, especially with fetidity, he has always found micrococcus in large quantity.

CONTENTS